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ORIGINAL PAPER

Does the perception of climate change vary with the socio-demographic dimensions? A study on vulnerable populations in Bangladesh

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Abstract This study tried to explore the perception of climate change by considering the socio-demographic dimensions of vulnerable populations in Bangladesh. This study included 158 respondents from an extremely flood affected area of Sylhet by using multistage sampling. This study used both quantitative and qualitative method to analyze data. Using several statistical tools and doing paraphrased translation of key information, this study find that the perception of climate change varies depending on the different socio-demographic dimensions such as gender, marital status, religion and age. Findings also show that the concern about climate change and the reasons for it as well as the prospective solutions and pathways to reduce its impacts are present in different socio-demographic dimensions. This study particularly reveals that the majority of the populations consider the reason of climate change from sinful activities of the individuals and wish of God. Other, however, considers that deforestation and river dredging are the reasons of climate change. And most people perceive that increasing education on the environment, changing human behavior and community level participation, can lead to reduce the adverse situations of climate change in developing countries like Bangladesh.

Keywords Climate change · Extreme climate events · Perception · Socio-demographic dimensions · Vulnerable area

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1 Introduction

Bangladesh is highly vulnerable to climate change, and almost two-thirds of the region is less than five meters above the sea level. Global climate change increases in the intensity of flood events which affects human quality of life (Cunningham et al. 2005). Extreme climatic events such as floods are common in Bangladesh and affect the country on a regular basis (Haque 1997; Agrawala et al. 2003). Climate change is prevalently perceived as a profuse risk in the developing countries (Kim and Wolinsky-Nahmias 2014). Around the globe, the majority of flood events are in South-Asia (39%) leading to life and economic loss. It makes the life difficult for people who are dependent on natural resources (Dutta et al. 2004, Salick and Byg 2007). They are many factors that increase the flood risk such as the glaciers melting in the Himalayas, monsoon precipitation and the intensity of cyclones (Huq 2002). In Bangladesh, there are approximately 30 million people live in the areas highly vulnerable for flooding as the result of the rising of the sea level along with tropical cyclones, flooding and riverbank erosion (Streatfield and Karar 2008). An increase in 2 °C in temperature and 45-cm sea level rise would enhance around 29% flooding risk in Bangladesh (Huq and Asaduzzaman 1999). These conditions combined with the socioeconomic situation of the country result in the loss of homes, land and property (Mohammad 2015).

Quantitative (size, growth and spatial distribution) and qualitative or demographic characteristics of the population of a country have both positive as well as negative impacts on natural resources and on environment (Huq et al. 1998). Socio-demographic dimensions such as gender (McCright 2010; Haq 2013), marital status and age (Kim and Moon, 2012); education (Kim and Moon 2012); employment status (McCright 2010) and political ideology (Sanchez and Lafuente 2010) influence the population perception of the climate change and environment. Though there are distinct conterminous of socio-demographic dimensions and climate change perceptions, both of them, however, are the population reasoning to reduce the impact of the concern of climate change and environment. Most of the research studies related to climate change perception and socio-demographic dimensions were carried out in the developed countries (Salick and Byg 2007). Only very few studies carried out in developing countries like Bangladesh are related to the socio-demographic dimensions and climate change perceptions. In a study, Anik and Khan (2012) appraised climate change related perception and illuminated multifarious adaptation strategies, but they didn't elaborate the nexus of climate change perceptions and socio-demographic dimensions. Another study by Huda (2013) suggested age, education, income and exposure to mass media as significant predictors of the perceptions of climate change. Rahman et al. (2011) included urban citizens of Bangladesh to comprehend the perception of general populations in terms of the environmental problems. All of these studies were conducted on urban populations and indigenous populations, but there is no study regarding the perception of climate change and socio-demographic dimensions particularly in vulnerable areas to extreme weather events in Bangladesh.

It was observed from several studies in other countries that the repertoire of socio-demographic dimensions influences the perception of the climate change and the environmental issues. A study conducted by Abegaz and Wims (2014) in Ethiopia concluded that the majority of the population (71.2%) are aware that the climate change is happening while 10% of the population don't think that climate is changing and 18.3% mentioned that they know nothing about climate change. In Bangladesh, 54.2% of the populations know that there is climate changes (Kabir et al. 2016). In the developed country, however, most

of the population, 86%, knows that there is climate change as indicated by the study of Dessai and Sims (2010) carried out on drought prone areas in Southeast England. In the study, we considered the factor of the local population's experience about the changes in temperature and in precipitation. We also considered how people impute their experiences from the adverse impacts of climate change (Helgeson et al. 2012). The objectives of this study was to understand the local population's perception of climate change, perceived reasons of climate change and how they consider to reduce the adverse impacts of climate change in the future. Finally, this study tried to explore how socio-demographic factors predominantly influence the climate change perception in the vulnerable area of Bangladesh. In this regard, we considered four socio-demographic dimensions factors: gender, age, marital status and religion and tried to explain their nexus with climate change perception. Basically this study hypothesized that climate change perception may vary with different socio-demographic backgrounds of vulnerable population.

2 Considered factors and hypothesis

2.1 Change in temperature and precipitation

Rising in temperature and annual precipitation, changes in seasonal rainfall patterns, more frequent and severe extreme weather events had been observed in Bangladesh in the recent years. Shahid et al. (2012) used 'diurnal temperature range' (DTR) and collected data on daily temperatures changes from 1961 to 2008. They found a variation in temperature and an increase in minimum and maximum temperature per decade for Bangladesh (Fig. 1). According to their study, the highest maximum temperature occurs in April and May, but the highest minimum temperature was from June to September (Fig. 2). Shahid and Khairulmaini (2009) collected data from 1969 to 2003 on average annual rainfall and showed fluctuations of average annual rainfall from year to year and an increase in annual rainfall in recent years. They also claimed a high spatial and temporal variation regarding annual rainfall in Bangladesh (Fig. 3). The monthly mean and percentage of annual rainfall was highest in July and lowest in December and January. In general, the maximum

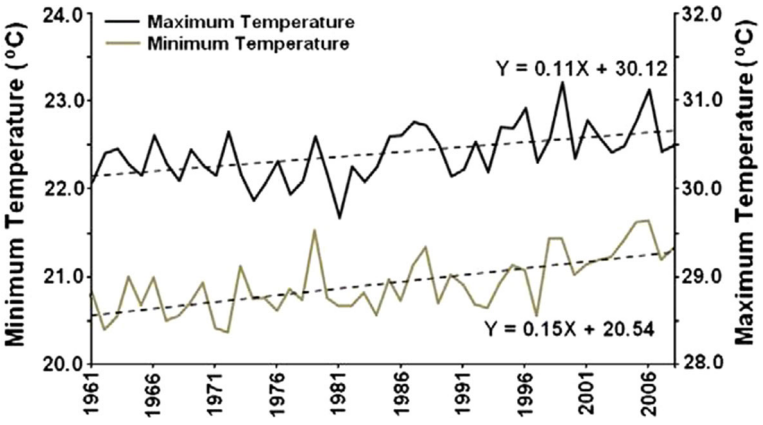

Fig. 1 Mean of maximum and minimum temperature (1961–2008), Bangladesh (*Source* Shahid et al. 2012:265)

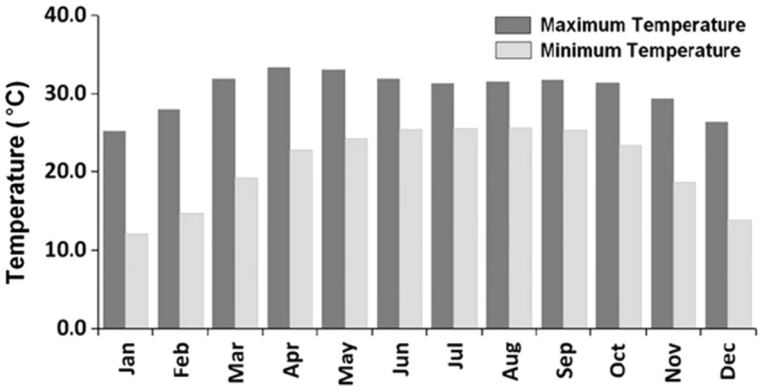

Fig. 2 Monthly minimum and maximum temperature in Bangladesh (*Source* Shahid et al. 2012:262)

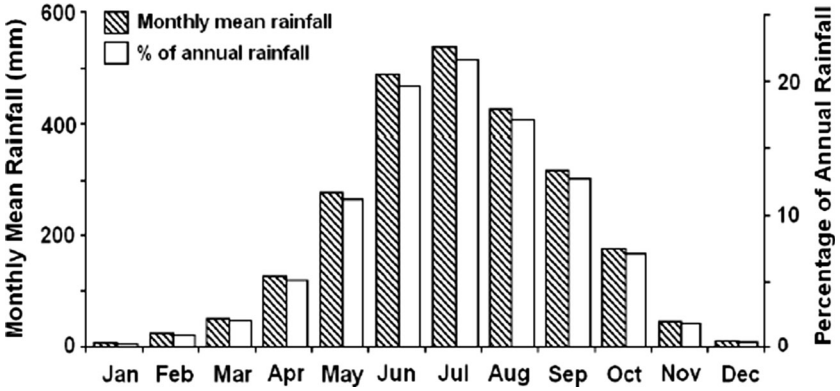

Fig. 3 Monthly mean rainfall and annual distribution of rainfall, Bangladesh (1969–2003) (Shahid and Khairulmaini, 2009:379)

percentage of annual rainfall occurs in June, July and August in the country. Another study by Shahid et al. (2015) collected data for 55 years (1958–2012) on daily rainfall and temperature and used nonparametric statistical methods. They found a significant increase in annual and seasonal mean of daily maximum and minimum temperatures for Bangladesh as well. Rahman and Lateh (2015) analyzed data from 34 meteorological stations over 40 years period and found that maximum temperature was observed in the southern and northeastern parts while an upward trend of annual rainfall was observed in the same areas. Regarding the perception of vulnerable locals, a study carried out by Kabir et al. (2016) on coastal and rural vulnerable populations found that 53.9% populations considered a change in rainfall pattern and 83.2% considered excessive temperature as climate change. Therefore, different studies in Bangladesh claimed the variation of temperature and precipitation. This study also aims to include the perception of local people about the observed changes in temperature as well as in precipitation.

2.2 Gender

Regarding gender and environment changes, several studies such as Diamantopoulos et al. (2003), Jacobs and Simpkins (2006) and Haq (2013) showed the variation of perception of men and women about environmental issues. Men exhibit more scientifically accurate knowledge about climate change than women (Jacobs and Simpkins 2006), whereas women underestimate their climate change knowledge more than men (McCright 2010). These studies also concluded that women express less trust in science to unriddle problems than men do and are more critical of science and technology. Contrarily, Haq (2013) observed higher environmental awareness among women than men in Bangladesh particularly in terms of environmental degradation. Diamantopoulos et al. (2003), Hunter et al. (2004), Smith et al. (2014) found that females hold stronger attitudes toward environmental quality than males and they tend to engage more in environmental issues than men in many nations. In Ethiopia, a higher percentage of women are aware of the climate changes (Abegaz and Wims 2014). Considering above mentioned studies, our study also hypothesized on the nexus between gender and the perception of climate change.

Hypothesis 1 Females are more concerned than males about the reasons of climate change.

2.3 Marital status

Several studies supported the idea that the marital status is a paramount factor influencing environmental concern and climate change perception but very few studies addressed the distinction between married and unmarried people on this matter (Swai et al. 2012; Kim and Moon 2012; Asekun-Olarinmoye et al. 2014); Addisu et al. 2016). For instance, Swai et al. (2012) revealed that perception on drought varies by marital status but didn't highlight the variation of perception between married and unmarried people. Asekun-Olarinmoye et al. (2014) and Addisu et al. (2016) found marital status statistically influences climate change perception. Kim and Moon (2012) wrapped up that married people and not single people implement the proactive environmental behaviors to consume less water and to buy energy-saving light bulbs. The studies of Macey and Brown (1983) and Neuman (1986) indicated the importance of marriage on environmental consciousness and influences of marriage on lifestyle changes that can lead perception of greenness. These studies suggested the differences between married and unmarried people perception regarding climate change and environmental issues and that lead us to consider the following hypothesis on the nexus between marital status and climate change perception.

Hypothesis 2 Married people are more concerned than unmarried people about the reasons of climate change.

2.4 Religion

Religion as one of the socio-demographic dimensions can shape individual's behavior and attitudes toward climate change (Carr et al. 2012). Jacka (2010) compared indigenous religions with world religion and concluded that indigenous religions are more supportive and raise ecologically susceptive behavior. Moreover, Schipper and Lisa (2010) argued that religious participation is crucial to understand the impacts of climate change. Gada (2014) strongly claimed that Islam is a way of life which can provide efficient, holistic and

comprehensive solutions to the recent environmental crisis. There are 759 relevant and potential verses in the Quran which reflects on the importance of ecology and nature emphasizing on tree plantation to combat the risk from deforestation and environmental degradation (Duh 2010). Another study also found that church attendance positively impacts the environmental concern of the population which delineates the stewardship ethic (Kanagy and Willits 1993). A study in Egypt reveals that Islamic teachings and religiosity are akin to pro-environmental behavior (Rice 2006). Hinduism, as a religion, is aware of humankind's role and responsibilities in Earth's ecosystem. Hindu people hold a deep reverence for life and are consciousness about the great forces of nature as well as all the various orders of life, including plants and trees, forests and animals (Whitney and Whitney 2012). Based on different studies on religious perspectives and environment, this study considered the influence of religious belief on climate change perception and formulated the following hypothesis.

Hypothesis 3 Hindu and Muslim people have different perceptions about the reasons of climate change.

2.5 Age

Many researchers have geared their efforts to understand climate change perception by considering age (Diamantopoulos et al. 2003; Lu 2012; Kabir et al. 2016). Kabir et al. (2016) found that older people (>60 years) are more concerned about climate change than young (<30 years) and older people (56.1%) mentioned that they know about climate change. Kim and Moon (2012) also concluded that older are more likely than younger to exhibit such behavior. However, several studies were conducted on the linkages between age and environmental issues or climate change, but only a very few study reported a significant relationships between the two (Diamantopoulos et al. 2003). Arcury et al. (1987) descried that younger members of the population exhibit higher levels of knowledge about climate change or environmental issues, whereas older populations are more concerned about the impacts of climate due to their experiences. In light of these above findings, this study considered the following hypothesis.

Hypothesis 4 Older people are more concerned about the reasons of climate change.

3 Research methodology

3.1 Description of the study area

This study was conducted at Sharat Pur village in Jamalganj upazila located in Sunamganj district in Bangladesh. This area is highly vulnerable to the impacts of climate change (Fig. 4). Sunamgonj is severely flood affected almost every year (IFAD 2010). Ecologically, this area is hydrologically situated in the northeast part of Bangladesh. It is 338.74 sq km in surface and harbor Naya Gang, Baulai and Dhanu rivers and the habitant of 18119 households (Banglapedia 2016). The maximum annual temperature of this area is 33.2 °C, minimum of 13.6 °C, and the precipitation rate is 3.334 mm (BBS 2013). The Sharat Pur village was selected out of 165 village because it is the most vulnerable part of the area to the flooding. Sharat Pur village in Jamalganj Upazila fits best of our criteria to get more insights how people living in flood affected area perceive the notion of climate change. During field visits, we observed that many NGOs such as ASA, BRAC, GRAMEEN as

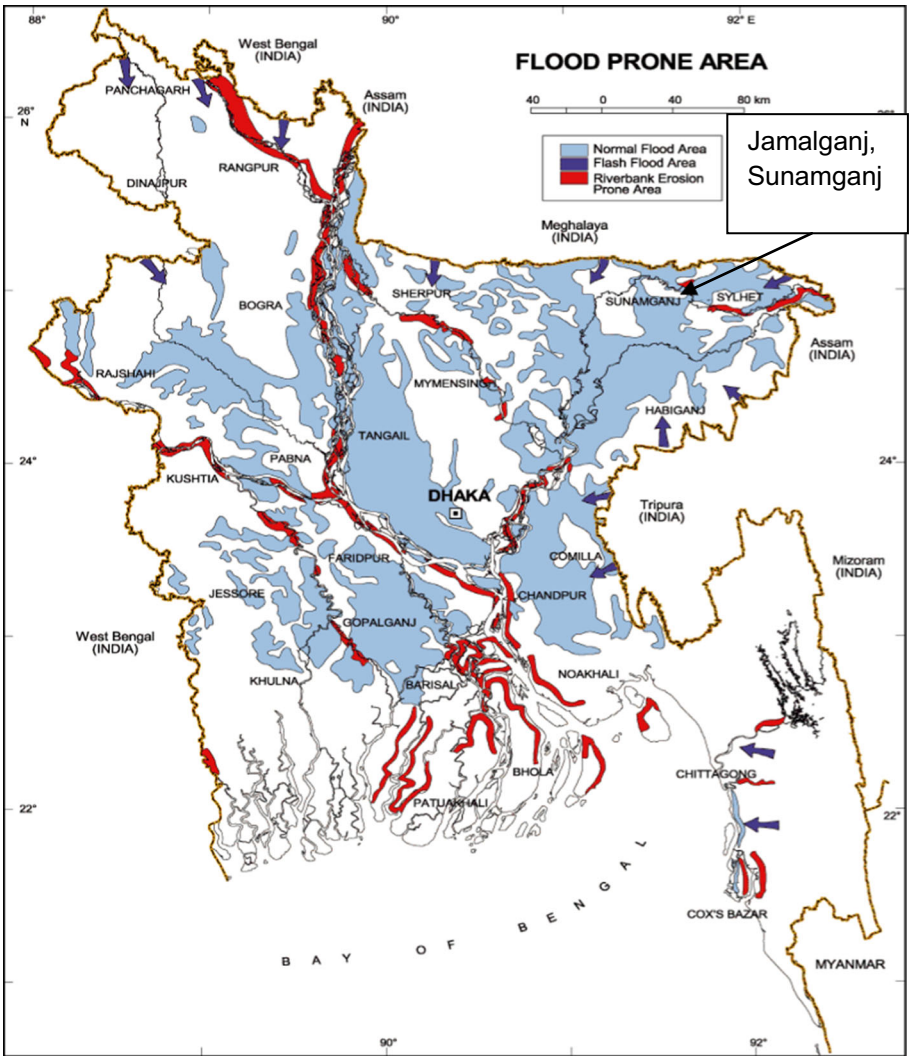

Fig. 4 Flood prone areas of Bangladesh and Jamalganj, Sunamganj (*Source* Maps of Bangladesh 2016)

well as European Union have projects for this vulnerable area dealing with disaster management and vulnerability.

3.2 Sampling technique

In Bangladesh, there are 64 districts. My research selected Sunamganj district from 4 districts in the Sylhet Division. Out of 10 Upazilas in Sunamganj district, Jamalganj upazila was selected and out of 165 villages in Jamalganj upazila, Sharat pur was selected as it was the most vulnerable village in the area with frequent floods. Four stage sampling technique was applied to select responders while sample determination technique included 158 responders (60 male and 98 female) as representative samples from 808 populations.

This total population includes 403 males and 405 females (including children). Of the 158 selected, 24 were unmarried and 134 were married. This study included 124 Muslim responders and 34 Hindu responders, respectively. The minimum and maximum age of those chosen was 16 years and 85 years, respectively (see Table 1). This study included about 20% of the total population from the selected village. The four stage sampling design was as follow: Sunamganj district area was selected as the primary sampling unit; in second stage we considered Jamalganj upazila, in the third stage very specific village was selected. In the four stage, targeted responders were included as the ultimate sampling unit of this study. This study included more female responders as they usually stay at home, and it was quite difficult to reach male responders since they go out to work early in the morning and come back only in the evening. Data was collected through a questionnaire survey and in-depth interview. In particular, we collected information by doing 'convenience sampling' (availability of respondents). Despite having a list of inhabitants, we were unable to question them all as many men were far from home for work at nearest cities during our visits.

We tried to include responders to match the relevant proportions of the population. This study included responders from the age groups 16–35 years, 36–55 years, more than 56 years. It was usually difficult to find responders above 50 years of age. However, we found plenty of responders of middle age; the number for those aged 16–35 was proportionally high compared with other age groups. We counted responders in each age category, and then we tried to interview those from an age group with few responders. In this case, we followed 'quota sampling' and targeted at least ten from each age group. We tried to include equal numbers of respondents from different age groups, marital status and religious backgrounds. But it was not possible, since there were more young people, married people and Muslim people so including more respondents from the age group 16–35 years, married and Muslim people was reasonable.

We interviewed mostly people who were home and who were willing to be interviewed. As it was not true random sampling, we could not totally ignore the possibility of errors in concluding this study's findings. Therefore, in-depth study in a remote village vulnerable to extreme flooding could provide an understanding of the variation of the perception of climate change regarding socio-demographic dimensions.

3.3 Data collection and analysis

To get a meaningful data and conclusion, this study scrutinized the secondary sources that are relevant to the perception of climate change in particularly changes in temperature and precipitation. We were eight field enumerators (divided into four groups), including two female to facilitate interviewing the females who most of them were highly conservative to talk with the outsiders. To speed up the data collection, we divided the village into four parts for the four groups. As the village was divided by a small canal, two groups went one side of the canal and two groups to the other side. During field visit, responders were asked simple questions about their observation on changes in temperature and precipitation and the reasons of climate change. We explained to responders first what climate change is. We found they only understand changing of raining periods and temperature like cold or hot and the impacts of flood coming from heavy raining.

Understanding the perception of climate change in relation to socio-demographic dimensions is a complex process (Jiang and Hardee 2011). To fulfill this study's objectives, this study combined both qualitative and quantitative methods to explore the dynamic relations between the perception of climate change and socio-demographic dimensions at

Table 1 Characteristics of responders and participants' concern about climate change

Socio-demographic characteristics and items	Percent (*N*)
Gender	
Male	38 (60)
Female	62 (98)
Religion	
Muslim	77.2 (122)
Hindu	22.8 (36)
Marital status	
Unmarried	15.2 (24)
Married	84.8 (134)
Age (years)	
Younger (16–35)	49.4 (78)
Middle age (36–55)	36.6 (58)
Older (56+)	14 (22)
Do you know what 'climate change' is?	
Yes	83% (131)
No	17% (27)
Do you find any changes in temperature?	
Yes	80% (126)
No	12% (19)
Unsure	8% (13)
Do you find any changes in precipitation?	
Yes	78% (123)
No	16% (25)
Unsure	6% (10)
Do you know the reasons of climate change in Bangladesh?	
Yes	62% (98)
No	34% (54)
Unsure	4% (6)
Do you know why climate is changing or why flood is occurring?	
Wish of God	52% (82)
Cutting trees, hills, and sands withdrawal from rivers	35% (55)
Results of sinful activities	13% (21)
Items on climate change perception (Mean, $N = 158$)	
Item 1 Climate change is happening in Bangladesh.	3.9
Item 2 Climate change is an important issue in Bangladesh.	3.6
Item 3 Climate change is the results of human activities.	3.2
Item 4 Climate change isn't natural.	1.8
Item 5 Environmental education can minimize the adverse impacts of climate change.	3.9
Item 6 Changing human behavior can contribute to tackle adverse impacts of climate change	3.4
Item 7 Community level participation is needed to tackle with the climate change.	4.0

local level (Hummel et al. 2012; Schultz and Elliott 2012). Seven items were included along with 5-point Likert scale (Tatlidil et al. 2009; Odendo et al. 2010) (see Table 1) to understand the perception of local people about climate change (item 1,2,3,4) as well as local opinions about tackling its adverse impacts (item 5,6,7). Responders were asked to provide opinions and reactions on different items, and their reactions were coded according to their level of agreement on each item such as strongly agree, agree, unsure, disagree and strongly disagree. I adapted Rahman's (2003) study in Bangladesh for my research. I put scores of 5 for strongly agree, 4 for agree, 3 for unsure, 2 for disagree and 1 for strongly disagree. We then calculated the arithmetic mean based on the scores (Wei et al. 2009). Mean scores explain the opinions of responders toward the level of perception and experience of climate change for different items. Our scale was kept at the 1–5 range. For example, if a responder mentioned that he/she strongly agrees with an item, then it was given a score of 5. In our research, if the calculated mean is close to 5 at the 1–5 range, it reflects the vulnerable population's high level of perceptions and low mean reflects a low level of perception (Rahman 2003; Odendo et al. 2010; Tatlidil et al. 2009; Wei et al. 2009). Partial correlations and bivariate analysis were used to understand the significant association between items by controlling socio-demographic dimensions. Moreover, ANOVA test was considered to know responders opinion on whether they know about climate change or not together with the mean scores from different items. This later, the mean scores for socio-demographic backgrounds (gender, marital status, religion and age) by using SPSS (Tiwari et al. 2010) were used to compare the level of perception between male and female, married and unmarried, Muslim and Hindu living in the study village and also different age groups such as younger, middle age, and older. This study also used Chi-square test and factor analysis. Furthermore, qualitative information was picked up to know the perception of local people about the reasons of climate change. Particularly, paraphrased translations of local language of responders about climate change were used to highlight their perception of climate change regarding their socio-demographic backgrounds.

4 Socio-demographics and perception of climate change

As summarized in Table 1, it included 38% male and 62% female responders; 77.2% Muslim and 22.8% Hindu responders; 15.2% unmarried and 84.8% married respondents; 49.4% younger, 36.6% middle age and 14% older inhabitants. We found that 83% inhabitants know about climate change while 17% don't know about it. 80% and 78% observed changes in temperature and precipitation, respectively. 62% of locals attributed their local perception about the reasons of climate change, while 34% don't know why climate change is happening. However, 52% inhabitants considered climate change as the wish of God, 35% added human activities such as deforestation and river dredging as the cause of climate change. 13% considered that people are doing immoral activities and thus climate change occurs to punish them.

5 The notion of climate change and vulnerability in Sharat Pur village: local experience

Regarding temperature, Table 2 shows that 41% experienced it as very hot in the summer and very cold in winter, while 29% mentioned that it is very hot in summer season but did not mention about the winter. 13% also mentioned that there was very high and rapid

Table 2 Climate change in Sharat Pur village, Bangladesh

Climate change in vulnerable area	Percentage (*N*)
Changes in temperature	
Very hot in summer and very cold in winter	41 (55)
Very hot in summer	29 (39)
High fluctuation in temperature	13 (17)
Very cold	8 (11)
Don't find any changes	8 (11)
Hottest month	
Boishakh (April–May)	37 (56)
Choitro (March–April)	23 (35)
Josto (May–June)	19 (29)
Bhadro (August–September)	12 (18)
Hottest year	
2004	6 (8)
2008	8 (11)
2009	16 (22)
2010	14 (20)
2011	18 (26)
Don't know	38 (54)
Changes in precipitation	
Increase	32 (45)
Decrease	30 (42)
Fluctuation	24 (33)
Don't observe any changes	14 (20)
Heavy raining month	
Ashar (June–July)	62 (94)
Srabon (July–August)	15 (22)
Josto (May–June)	13 (19)
Heavy raining year	
2004	34 (46)
2008	13 (18)
2009	5 (6)
2010	8 (11)
2011	5 (6)
Don't know	32 (43)

fluctuation in temperature in the last ten years. To recapitulate, 70% (41 and 29%) locals observed that temperature is increasing. According to responder's observation in the last ten years, 37% responders found Boishak (April–May), 23% told Choitro (March–April), 19% mentioned Josto (May–June) and 12% mentioned Bhadro (August–September) as the hottest months in the year. These results indicate the variation of habitant's perception on the hottest months of the year. But 38% responders were not able to say which year it was the hottest in the last ten years. Only 18% mentioned 2011, 16% mentioned 2009 and 14% mentioned 2010 as the hottest year in last ten years. That means that in recent years, temperature is increasing and people feel hot compared to other years in the last ten year

periods. However, these results also bespeak the variation of the habitant's perception on the hottest months of the year.

Regarding changes in precipitation in the last ten years (Table 2), 78% said that they find changes in raining season while 16% said that they do not observe any changes; and 6% were unsure. 32% mentioned they observed an increase in the raining, 30% stated a decrease, while 24% mentioned a variation of raining periods. This data show that people opinion about raining period varies and differ from one to another. In regard of the month for the heavy rain in the last ten years, 62% mentioned it is Ashar (June–July), 15% Srabon (July–August) and 13% mentioned Josto (May–June). For the year of heavy rain, 34% mentioned it is 2004, while 13% indicated 2008. They mentioned that they were highly affected by flood in the years. On the contrary, 32% were unable to state which year there was heavy rain demonstrating that a proportion of responders living in the vulnerable area (Bangladesh) do not pay attention about climate change (Table 2). Responders also mentioned how extreme climate event (flood) affects their life. 38% said that floods destroy their houses and kill cows, 19% faced food crisis during extreme flood periods where 10% said that flood destroy crops and cover all their cultivable lands. These responders stated that during this period they did not have any income and work during and borrowed money from business man or NGOs with high interest.

46% mentioned that they were highly affected two times by flood, 26% were highly affected three times by flood and 16% were highly affected four times by flood and only 12% mentioned that they were highly affected only once by the flood. These data indicate that people living in the study area always are affected by floods and it brings adverse impacts on their life style. 82% mentioned about flood in 2004 was the worst and severe. Only 13% mentioned about flood in 2008 that caused damages to them. Responders were asked how they tackle the crisis periods. In responses, 56% responders mentioned that they borrowed money with high interest to overcome crisis and recover damages due to extreme floods. Borrowing money from businessmen and sometimes from NGOs is the only option they had. They mentioned that the supports they receive from NGOs and government were not sufficient.

6 Reasons of climate change: local perspectives

There are several reasons for climate change around the globe but the most responsible factor is the global warming from green house gas emissions. Human caused climate change by increasing CO2 levels due to emissions from fossil fuel, aerosols and cement manufacture, land use, ozone depletion, animal agriculture and deforestation (Minar et al. 2013). In this study, beside these reasons of climate change, we tried to scrutinize the local perspectives of the responders based on socio-demographic dimensions. From the findings, we gathered three potential reasons for climate change such as: wish of God; cutting trees, dredging river for sands, construction and the last but not the least reasons that is climate change is the result of sinful activities.

Approximately, 62% responders were aware of the reasons of climate change, while 34% mentioned that they didn't know the exact reasons for climate change. Among those who know the reasons, 52% perceive that climate change is the ***wish of God***. With quantitative evidences, this study also used some qualitative information to highlight the perception about climate change. Few translated paraphrased collected during field study are elucidated below. It helped to strengthen and do the analysis more rigorously.

Important and significant statements from responders showed their perception and how they relate the climate change to social factors and their level of concern about the impacts of climate change and reasons of climate change. A male respondent (Married, 24 years, Muslim) mentioned that *I do not have idea why climate is changing and I am ignorant. But having flood, hot and rain depend on the Allah's order or wish*. A male respondent (Married, 32 years, Muslim) told that *if we cut trees and hills, it's not matter, since men cannot create or control floods or cyclones. Everything happens by the wish of Allah*. A male respondent (Unmarried, 21 years, Muslim) said that *Allah can give us rewards and can give us punishment as well. Allah is all in all and supreme and can change everything even climate change like changing raining periods and hot season, flood periods, if Allah wishes*. A female respondent (Married, 38 years, Muslim) mentioned that *everything even a leaf from a tree can't move without the order of Allah. So flood, cyclones, very hot, very cold happens by Allah's order.* These perceived notions of responder's highlights the wish of God as a reason for climate change and it varies based on socio-demographic dimensions.

Deforestation and river dredging is another reason for climate change perspective by local populations. The prevalent feeling of the responders was cutting down and burning of trees, picking up sands from river for several purposes are the reasons behind the climate change. Particularly, 35% responders claimed that deforestation and river dredging is the another culprit for climate change. More seemingly, paraphrased translation of a female respondent (Unmarried, 16 years, Muslim) provided that *climate change events (flood) happen due to Allah's wish and cutting tress and hills excessively. And it's the combination of Allah's wish and human activities.* However, this information suggests both God's wishes as well as human activities as the cause of climate change, while some responders mentioned about the cutting trees and hills as the reason of climate change.

Despite there are many underlying and proved scientific reasons for climate change, it is potential to highlight the perspectives of locals about the climate change and the reasons of climate change. From this study, we found that a proportion of responders consider that climate change occurs as ***result of sinful activities***. Paraphrased translation of responder's opinions in local language showed this type of reasoning. A male respondent (Married, 65 years, Hindu) said that *very hot or cold, flood and cyclones are the results of doing sinful or immoral activities and not following all the words from* Bhagavan*. These days' people don't do religious activities (Aradona) to make happy our "*Bhagavan*"*. A male respondent (Unmarried, 17 years, Muslim) mentioned that *flood as climate change is the outcome of people's lying a lot and doing immoral works in recent times*. A female respondent (Married, 25 years, Muslim) told that *everything depends on Allah's wish and Allah is unsatisfied because people do sinful activities and they do not pray every day*. A female respondent (Married, 22 years, Hindu) said that *Bhagavan are not happy on the activities we are doing now such as women go out to do work, not following* Bhagavan*'s order*. A female respondent (Married, 50 years, Hindu) mentioned that Bhagavan says that *if people do sinful activities and immoral works, Bhagavan will give us punishments such as flood, cyclones, drought* etc. From local perspectives, it is evident that direct results of sinful activities by human being are also a reason for climate change and people particularly mentioned about disobeying the orders of God, telling lies and not praying regularly.

7 The nexus between socio-demographic dimensions and perception about climate change

7.1 Gender and climate change perception

The findings reveal that most of the responders are aware of the climate change though it was differed from men to women. Approximately 66% female responders and 56% male responders were concerned about the climate change and knew about it. In terms of **reason of climate change**, about 63% female and 37% male pointed out that it is the wish of Allah or Bhagavan. 65% male and 35% female mentioned that climate change is the result of cutting trees and hills, picking up sands from river and filling river with soil for building construction. Almost 84% female and 16% male thought that climate is changing due to the increasing sinful activities (Table 3). These results as well as Chi-square test ($p < 0.05$) suggest that females are more concerned about the terms of climate change reasons. To recapitulate, this finding demonstrates that females are more concerned about the climate change than male as well as most of them perceive that climate change is the result of sinful activities and it is the God's wishes.

In terms of **change in temperature**, nearly 85% female and 73% male outlined that they felt changes in temperature. In addition, 41% male and 59% female felt the heavy heat in the last ten years, while 27% male and 73% female mentioned that they felt both heat and cold (Table 4). Considering all responders opinion on **changes in precipitation**, 78% of both male and female mentioned that they find changes in precipitation. However, 52%

Table 3 Socio-demographic dimensions and the reasons of climate change

Socio-demographic dimensions	Reasons of climate change		
	Wish of God % (*N*)	Human activities % (*N*)	Results of sinful activities % (*N*)
Gender			
Male	37 (30)	65 (11)	16 (3)
Female	63 (52)	35 (6)	84 (16)
Total	100 (82)	100 (17)	100 (19)
Marital status			
Unmarried	15 (12)	35 (6)	–
Married	85 (70)	65 (11)	100 (20)
Total	100 (82)	100 (17)	100 (20)
Religion			
Islam	93 (74)	55 (11)	45 (9)
Hindu	7 (6)	45 (9)	55 (11)
Total	100 (80)	100 (20)	100 (20)
Age			
Younger (16–35)	53 (30)	58 (23)	23 (3)
Middle age (36–55)	37 (21)	27 (11)	54 (7)
Older (56+)	10 (6)	15 (6)	23 (3)
Total	100 (57)	100 (40)	100 (13)

male and 48% female mentioned there is a decrease in raining and 80% female and 20% male mentioned an increase in raining (see Table 4).

7.2 Marital status and climate change perception

Marital status is another socio-demographic factor considered in this study to explore the nexus between socio-demographics and climate change perception in the extremely weather event (floods) affected areas in Bangladesh. Approximately 75% unmarried and 25% married responders perceive the **reasons of climate change**. Beside this point, 85% married and 15% unmarried responders considered climate change as a wish of Allah or Bagman; all of the married state that climate change is a result of an increase in sinful activities. Interestingly, none of the unmarried responders mentioned that climate change is the results of an increase in sinful activities. Moreover, nearly 35% unmarried and 65% married responders mentioned that climate change is due to high population, cutting tress and hills, sand withdrawal from river and filling river for building construction (Table 3). Seemingly, Chi-square test ($p < .05$) demonstrates that considering the marital status of responders, *married and unmarried people had different opinions on the reasons for climate change*. It shows that unmarried people are less concerned about climate change compared with married people who usually consider climate change as Allah or Bagman's wish, as human activities and as an increase in sinful activities. Few of the unmarried responders considered human activities as the reason of climate change. Particularly 75% unmarried and 81% married people mentioned that they find **changes in temperature**.

Table 4 Changes in temperature and precipitation based on socio-demographic dimensions

Socio-demographic dimensions	Changes in temperature				Changes precipitation		
	Very hot	Very hot and very cool	Frequent fluctuation	Very cold	Irregular raining	Increase raining	Decrease raining
Gender							
Male	41 (16)	27 (15)	47 (8)	36 (4)	46 (15)	20 (9)	52 (22)
Female	59 (23)	73 (40)	53 (9)	64 (7)	54 (18)	80 (36)	48 (20)
Total	100 (39)	100 (55)	100 (17)	100 (11)	100 (33)	100 (45)	100 (44)
Marital Status							
Unmarried	23 (9)	7 (4)	29 (5)	0 (0)	12 (4)	9 (4)	19 (8)
Married	77 (30)	93 (51)	71 (12)	100 (11)	88 (29)	91 (41)	81 (34)
Total	100 (39)	100 (55)	100 (17)	100 (11)	100 (33)	100 (45)	100 (44)
Religion							
Islam	72 (28)	84 (46)	88 (15)	91 (10)	82 (27)	84 (38)	74 (31)
Hindu	28 (11)	16 (9)	12 (2)	9 (1)	18 (6)	16 (7)	26 (11)
Total	100 (39)	100 (55)	100 (17)	100 (11)	100 (33)	100 (45)	100 (44)
Age							
Younger	51 (20)	54 (30)	76 (13)	37 (4)	54 (18)	38 (17)	60 (25)
Middle age	33 (13)	33 (18)	24 (4)	26 (3)	30 (10)	44 (20)	33 (14)
Older	16 (6)	13 (7)	0 (0)	37 (4)	15 (5)	18 (8)	7 (3)
Total	100 (39)	100 (39)	100 (17)	100 (11)	100 (33)	100 (45)	100 (44)

23% unmarried and 77% married people found changes in temperature to be very hot; and 94% married and 7% unmarried people mentioned about changes in temperature as very hot and very cold in the last ten years. 71% unmarried and 79% married people said that they find **changes in precipitation**. 19% unmarried and 81% married mentioned a decrease in raining, while 91% married and 9% unmarried mentioned an increase in raining (Table 4).

7.3 Religious views to the climate change perception

In the study area, there are two religious groups Muslims and Hindus from whom the data were collected. Our findings discovered that 61% Muslim and 67% Hindu responders are concerned about the climate change. On the other hand, a similar percentage, about 34% responders from both groups mentioned they know the **reasons for climate change**. Most of the Muslims, 93% consider that climate change is the wish of God which reflects the more religious tendency while most of the Hindu responders (55%) think that increasing sinful activities is the reason for changing climate (Table 3). In here, 55% Muslim and 45% Hindu considered climate change as related with human activities. Moreover, Chi-square test with p value .002 highlighted *that Muslim and Hindu people have different opinions on the reasons for climate change*. This reckoned that most of the Hindu people consider human activities are involved in climate change, whereas most of the Muslim people consider religious values and beliefs as the significant reason for climate change.

A similar result was found in the **changes of temperature and precipitation** (Table 4) in which both Muslim and Hindu responders shared almost similar perception about the hot and cold season as well as the increased or decreased of raining. Considering religion, changes in temperature and precipitation, 83% Muslim people and 71% Hindu people mentioned that they find changes in temperature. 84% Islam and 16% Hindu people mentioned the experience of climate change as very hot and very cold weather; 72% Islam and 28% Hindu people said climate change as very hot weather. Consecutively 88% Islam and 12% Hindu respondents claim frequent fluctuation of temperature. Moreover, 80% Muslim people and 70% Hindu people found changes in precipitation. 84% Muslim and 16% Hindu people found an increase in raining, while 74% Muslim and 26% Hindu people mentioned about a decrease in raining.

7.4 Age and perception about climate change

Among those who know about the climate change, 49% are 16–35 years old; almost 37% are 36–55 years old (middle age) and approximately 14% are more than 56 years category (older). This shows that younger people are more concerned as they know the **reasons of climate change** in this locality. It could be that they had enough opportunity of learning about the scientific reasons of climate change. The following table (Table 3) shows that 53% younger people believe that climate change or the extreme weather events are the wish of God, while only 10% older support this statement. Moreover, 58% younger, 27% middle aged people and 15% older supports and claims the human-induced climate change, that is due to high population, picking up sands from river, filling rivers to build industry, cutting trees (deforestation), industrial expansion and environmental pollution. 54% middle aged people, 23% of both younger and older claims that climate change is the results of sinful activities, particularly, according to local perspectives, people are not obeying the rules of religion as well as they are telling lies and doing illegal activities that's why God are giving them punishment. However, these findings don't elucidate any significant

variation regarding age of responders. Chi-square test ($p > .05$) doesn't suggest any potential variation on the perception of climate change reasons regarding age variation. This suggests that there is *no significant difference regarding the reasons of climate change and age background* in this study.

Regarding **changes in temperature** (see Table 4), among those who claimed that they observed temperature changes in the last 10 years, 42% are young people, 28% are of middle age and 11% are old people. Consecutively, 55% younger, 33% middle aged people and 16% older observe the weather as very hot. 54% younger, 33% middle aged and 13% older experience it as very hot as well as very cold. 76% younger and 24% middle aged experience frequent fluctuation in temperature. Moreover, 37% for both younger and older, and 26% middle aged people observed a very cold weather in the winter. Contrarily, in terms of **changes in precipitation** (see Table 4), 54% younger, 30% middle aged people, 15% older people experience irregular rainfall during the last 10 years. 38% younger, 44% middle aged and 18% older experience increasing rainfall; and consecutively 60% younger, 33% middle aged, 7% older observe decreasing rainfall.

8 Perception and opinions to tackle the impacts of climate change: local understandings

This study included seven scale items as described in Table 5 to know the climate change perception and how its adverse impacts of climate change could be tackled at the local level. The perception of climate change (Item 1, 2, 3, and 4) was explored combining socio-demographic dimensions such as gender, marital status, religion and age. The table below shows that mean value for male was higher than female for item one and two implying that they are more concerned about Bangladesh climate. They advocate that climate changing should be considered as an important issue. The mean value for female was higher than male for item three and four indicating that female are more concerned. Also they claim that climate change is the results of human activities and it does not happen naturally. The results also reveal that unmarried have higher mean than married for item one, two, three and four. It indicates that the unmarried are more concerned than married people and perceive the changing as consequences of human activities and is not naturally happening. The Hindus score much higher than Muslim people for every item, except item three. They perceive the climate is changing and consider it as an important issue of the 21st century. Hindus explain that climate change isn't a natural phenomena rather it is the results of human activities. In terms of age, the mean value is higher than 3 only for item one, except the older category. Mean of younger and middle aged is higher than old people in perceiving that climate is happening in Bangladesh.

Responders were asked how they tackled the adverse impacts of extreme weather events, particularly the floods. Many mentioned they took loan from local people and NGOs to surmount their crisis during extreme floods. Most of them don't know what climate change as well as they don't have enough scientific knowledge about it as their educational level is very circumscribed. In our study, the populations were asked on three items exploring the nexus of climate change and adaptation measures of the community. These three items are: **raising environmental education**, **changing human behavior** and **community level participation**. In terms of the pathways of tackling the adverse impacts of climate change, three items (item 5, 6 and 7) were introduced to the responders. For these items, similar responses were observed on the basis of gender, marital status, and

Table 5 Socio-demographic dimensions and mean of different items

Socio-demographics	Scale items						
	Climate change in Bangladesh	Climate change as an important issue	Climate change as human activities	Climate change isn't natural Phenomenon	Environmental education as potential solution	Changing human behavior	Community level participation
Gender							
Male	4.59	3.82	3.64	2.91	3.55	1.72	1.32
Female	3.72	3.53	3.80	3.50	3.12	2.36	1.35
Marital status							
Married	4.04	3.61	3.72	3.25	3.23	2.13	1.26
Unmarried	4.15	3.80	3.85	3.42	3.10	2.04	1.75
Religion							
Islam	3.94	3.50	3.74	3.21	3.10	2.08	1.19
Hinduism	4.47	4.15	3.72	3.52	3.60	2.25	1.88
Age							
Younger (16–35)	3.25	2.77	2.09	1.39	3.45	2.91	3.66
Middle aged (36–55)	3.51	2.82	1.87	1.04	3.22	2.80	3.77
Older (46–65+)	2.94	2.97	1.77	1.63	3.14	2.19	3.10

religious background except the age category. The mean value of item five was found more than three for all groups of socio-demographic dimensions. It claims that environmental education can reduce the adverse impacts of climate change in Bangladesh. Interestingly, we found that younger perceive the environmental education is important element to cope with the devastating impacts of climate change. In contrast, older people claim that the community should engage to help coping with the scourge of the environment resulted from the climate change.

This study explicates the perception of climate change by considering seven scale items. Factor analysis of these scale items was used to notch more insight about climate change perception, and our main findings are shown in Table 6. It shows that large KMO value exists for the seven scale items reducing two factors from the factor extraction process. Table 6 shows that four items were loaded strongly with factor 1 and three items were loaded significantly with factor 2. Factor 1 suggests that those who think that climate change happens due to the human-induced activities also think it does not happen naturally. The responders also think that human activities and lifestyle should be changed and participation of local people is crucial to tackle the devastating effects of climate change, especially the floods. For factor 2, we can say that people who think of climate change in Bangladesh also consider it as an important discussion matter of the vulnerable populations. They also think that promoting environmental education at the national and local level can make people more cognizant about the reasons and impacts of climate change.

There are many ways for vulnerable population to consider climate change. It is important that understanding the local populations' perception about its impacts can help to find adequate adaptation strategies. Increasing the ***environmental education*** of the population is found as the best pathway to reduce the vulnerability from climate change and weather adverse events. In this study, we found that the partial correlation coefficient (where socio-demographic variables were controlled) illustrated that raising environmental education and change of human behavior were significantly correlated (.402 and p value .000). It demonstrates that people who think that environmental education can help to tackle the hostile impacts of climate change and they also reckon that changing human behavior can diminish the risk of the vulnerability to the climate change and extreme weather events. Moreover, a bivariate analysis (without controlling variables) of different items demonstrates that raising environmental education and change of human behavior are meaningfully correlated. This finding evokes that environmental education can help to

Table 6 Major results from factor analysis of scale items

KMO value = .759	
Factor extraction	Eigen value
Factor 1	2.923
Factor 2	1.080
Rotated component matrix	Coefficients value
Factor 1	Item 3 (.706)
	Item 4 (.786)
	Item 6 (.763)
	Item 7 (.522)
Factor 2	Item 1 (.861)
	Item 2 (.827)
	Item 5 (.503)

tackle the adverse impacts of climate change while changing human behavior can reduce its risk. These findings suggest that if people have knowledge about environmental issues they would be more aware to protect themselves from any adverse impacts of environmental degradation. The field study explored that religious leaders (Imam) and political leaders (Member) are considered as influential persons in the local community or village. This study advocates for training of the political and religious leaders to teach the local people about the environmental issues.

There are many ways to reduce the risk of the vulnerability of the climate change as well as pertinent extreme weather events. In this study, the local perspectives reckoned that ***change in human behavior*** such as stopping cutting the trees, stopping dredging the rivers, controlling the industrial growth, not polluting the environment, controlling the population growth, all could play a philanthropic role to decrease the endangered from climate change. ANOVA test for responders shows that people who know about climate change and who do not know about it had a significant mean difference ($p < .05$) for scores of items. Particularly, people who said that they know about climate change are more concerned about it and perceive it as a result of human activities. Bivariate analysis (coefficient: 0.539) demonstrates a similar results. Most of the local people perceived that increasing the community awareness of climate change is an effective step to reduce its impact as well as effect of extreme climate change events, such as flood. For example, the mean score highlights the community perception and its participation as a coping strategy during the extreme climatic events as well as it is needed to combat the risk of climate change. ***Community level participation*** is associated with changing the human behavior and environmental education. However, the partial correlations (correlation coefficient of community level participation and environmental education: 0.261; correlation coefficient of community level participation and change of human behavior: 0.336) and Bivariate analysis (correlation coefficient of community level participation and environmental education 0.305; correlation coefficient of community level participation and change of human behavior 0.331) don't provide a strong association among them. The field study evokes that working together is very potential element to tackle the adverse impacts of climate change. This study advocates that if local people would come forward to help others who are helpless and those who lost properties during floods, then their vulnerability would be minimized.

9 Discussions

This study was designed to investigate how the perception of climate change varies with socio-demographic dimensions in vulnerable areas of Bangladesh. There were several studies on climate change perception, climate change adaptation and mitigation, but there is a very few studies considered the links between the climate change perception and socio-demographics backgrounds. In our study, we found that many local inhabitants are concerned about climate change, a finding that is supported by other studies carried out in Bangladesh by Kabir et al. (2016), in Ethiopia by Abegaz and Wims (2014), in China by Yu et al. (2013) and in England by Dessai and Sims (2010). In our study, the majority of people (83%) are concerned about climate change, whereas in two LDCs countries it was 51.3% in Nepal and 54% in Nigeria, respectively. This findings was compared with the recent report on 'World Wide Views on Climate and Energy' (2015) that shows 97% world population are concerned about the impacts of climate change and 78% are 'very

concerned' about it. In Bangladesh 81% of the population are 'concerned' about the impacts of climate change which corresponds with this study finding. However, we can't say that people living in this study area are very concerned about climate change since mean scores for all items were not high or close to 5.

Regarding the local people's notion on temperature and precipitation change, this study shows that almost 80% of total responders find changes in temperature. Approximately 70% of total responders observe very hot in summer. In terms of precipitation, 78% observe changes in rainy season, 32% observed an increase in raining, 30% observed a decrease of raining and 24% find a frequent variation of rainfall in a year. For Bangladesh, other studies carried out by Kabir et al. (2016) revealed that local inhabitants observed excessive in temperature and the changing patterns of precipitation. In addition, by analyzing data on temperature and precipitation studies carried out by Shahid et al. (2015), Shahid and Khairulmaini (2009), and Shahid et al. (2012) showed the increase in temperature and the fluctuation of precipitation in Bangladesh. A similar study was carried out in Nepal by Tiwari et al. (2010) found that most of the responders (75%) experienced increasing temperature.

Regarding the reasons for climate change, previous studies have pointed to deforestation and changes in life style (Kabir et al. 2016) and different human activities (Adem and Bewket 2011; Ozor and Cynthia 2011). Altschuler and Brownlee (2015) consider local perception of climate change has a connection with different factors such as environmental knowledge, environmental awareness, attitudes, beliefs and the perception of risk. This study found that 52% people perceive climate change as the wish of God. However, in a large scale survey on 'climate change perception' by Asia Foundation (2012) in Bangladesh found that 11% of the population consider deforestation and river dredging and 12% consider the sinful activities of human for climate change. In our study, most of the responders attributed the reason of climate change as a wish of Allah/Bhagavan due to their strong religious beliefs. Studies carried out by Gada (2014), Duh (2010) and Whitney and Whitney (2012) pointed that a different perception of environmental issues is influenced by religious belief. In this study, we found that 61% Muslim and 67% Hindu know about climate change. More Muslim (61%) compared to Hindu attribute the climate change as the wish of God. On the other hand, 56% Hindu consider climate change is occurring due to an increase in human involvement such as population increase, deforestation, withdrawing sands and fishes from river.

Regarding the gender and the climate change perception, few studies addressed this matter. McCright (2010), Haq (2013) and Kabir et al. (2016) claimed that women are more concerned about environmental issue and climate change. Interestingly, we found a similar pattern in our study. In terms of the reasons of climate change, more women than men consider climate change as the wish of God and the results of sinful activities and more men than women consider human-induced climate change. From the paraphrased translation of qualitative information, this study also observed that both male and female think that doing immoral activities, avoiding the rules and regulations of religion such as not praying properly and telling lies are the reasons for changing climate. The change could be manifested through the weather getting very hot, very cold and irregular and untimely rainfall. In the case of marital status, different studies (Kim and Moon 2012; Macey and Brown 1983; Neuman 1986) claim that married people are more concerned than unmarried about environmental issues and climate change. However, 75% of unmarried compared to 25% of married is more concerned about the reasons of climate change in this study. Many married people consider climate change as a wish of God, human activities and the results of sinful human activities. Contrarily, few unmarried people consider climate change as

human-induced activity. These findings is due to the fact that married people are more engaged in family life and performing more ritual practices due to their strong religious belief. Whereas some unmarried people who are younger and educated consider population pressure, cutting trees and hills, extraction of resources (e.g., fish and sands) from rivers as the reasons of climate change. On the other hand, Kim and Moon (2012), Kabir et al. (2016) showed that older people are more concerned than younger about the environmental issue. In this study, it is revealed that younger are more concerned than middle aged and older people in terms of climate change. Particularly, younger perceived climate change as the wish of God and also attributed human-induced climate change. Besides, more middle aged people than younger and older people perceive climate change as a result of sinful activities. We didn't find older responders as more concerned about climate change since very few olders are found during our field survey in the study area. However, this study didn't find any statistically significant variation about climate change perception in terms of age category. Meanwhile, a few in-depth interviews show that younger people are more concerned about the wish of God and human-induced reasons for climate change whereas middle aged people consider climate change are due to sinful activities.

This study included self administered seven scale items on climate change perception and how to tackle the adverse impacts of climate change events at the local level. We considered the qualitative information as supportive evidence to our quantitative analysis. Few paraphrased translations of key information indicate that unmarried Hindu males (middle age) are concern about climate change and think that it is an important issue for Bangladesh since this country is one of the most vulnerable countries of climate change. In terms of tackling the adverse situation of climate change, unmarried females (middle age) from both religion Muslim and Hindu perceive deforestation and river dredging as the reasons of climate change and it is induced by human activities. However, married males (old age) from both religions consider that climate change occurs as the wish of Allah/Bhagavan and it also occurs due to an increase in immoral activities and not performing rituals regularly. However, this study included more responders from younger and middle age. Proportionate and random inclusion of older responders from the areas vulnerable to different extreme weather events may be considered in any future research.

10 Conclusions and recommendations

In this study we tried to understand the perception of local people toward the reasons of climate change as well as opinion toward tackling the adverse impacts of climate change. People perceptions of climate change at local level may play a potential role to identify vulnerability to global climate change and to suggest some solutions for reducing the adverse impacts of climate change. Incorporating individual experiences and interpretations about climate change, reasons of climate and tackling ways can lead to identify the best policies at the local level (Brownlee et al. 2013) and scientific comprehension (Mercer et al. 2012). According to the local perspective, this study found that the wish of God, results of sinful activities, and deforestation and river dredging are the main reasons stated by the local population for climate change. People also think that environmental educational program, changing human behavior related with environmental degradation and participation of local people during crisis, could lead to minimize the adverse impacts of climate change. Meanwhile, regarding perception of climate change people's living in vulnerable area to extreme weather events think differently. In general, people living in this

study area were more concern about the increase in temperature, fluctuations and changing of rainfall patterns, and flooding from heavy rainfall.

This study suggests it is important to implement educational programs about climate change issues in vulnerable areas for these people to tackle with the adverse impacts of climate change (Howe et al. 2014). This study populations in Sharat Pur village consider extreme floods is an act of God and the adverse impacts of extreme floods are the results of sinful activities, such as not praying regularly and telling lies. This reveals that the majority of people do not believe that human activities, such as deforestation, taking sands from rivers are related to the occurrence of extreme floods or climate change events. This study also shows that village leaders who perform religious activities regularly such as Imams (Muslim leaders) and the elderly have an influence on other people concerning the occurrence of climate change events. Awareness raising programs by targeting Imams may upgrade their knowledge about the impacts of climate change. Imams in Islam are usually called religious leaders, especially in rural areas, as they talk about different issues every Friday in Mosques and people living in the villages also listen to their preaching.

In the study village, people who believe in Hinduism also listen to their religious leaders such as Pundits or Brahmins who perform marriages and other religious activities. Courses offered by the Bangladesh government and NGOs in cities for both religious leaders on the climate change as well as the impacts of climate change events could increase their knowledge. Government and NGOs should provide them some financial assistance and arrange their transportation and accommodation expenses so that they join the training program. As a result, they could explain and motivate people living in villages in their gatherings in the mosques or temples. The people will be more aware about the environment and take responsibility such as ending deforestation and taking sand from rivers.

The field study suggests that planting more trees, prohibition of dredging river, controlling the industrial pollution will be potential to reduce the adverse impacts of climate change. Our study also suggests that providing employment for the local people can enable them to avoid cutting trees, dredging rivers to pick up sands. Moreover, community-based activities, particularly working together is necessary to control the massive loss of devastating floods. This study suggests that government and local NGOs need to make more efforts to support the vulnerable people to tackle adverse impacts coming from extreme floods. However, this study suggests further research in areas vulnerable to different extreme weather events such as floods, cyclones, drought by including large populations and samples in developing countries including Bangladesh. A comparative study regarding socio-demographic dimensions and climate change perception in areas vulnerable to different extreme events can provide detail understanding and policy implications at national and transnational level.

Appendix

Interview Questionnaire

1. Gender: (a) Male (b) Female
2. Age:
3. Religion: (a) Islam (b) Hindu
4. Marital status: (a) Unmarried (b) Married
5. Education (Years of Schooling):
6. Do you know about climate change? (a) Yes (b) No

7. Do you find any changes in temperature last ten years? (a) Yes (b) No
8. What changes do you find in temperature?
   (a) very hot (b) very hot and very cold (c) Frequent fluctuation in temperature (d) Very cold (e) very hot and decrease cold (f) do not find any changes
9. Which month do you usually know as the hottest in a year? (a) falgun (b) chiotro (c) boishak (d) josto (e) asar (f) srabon (g) bhadro (h) do not know
10. Can you tell the hottest year and month during last ten years?
11. Do you find any changes in precipitation during last ten years? (a) Yes (b) No
12. What changes do you find in precipitation? (a) irregular raining (b) increase raining (c) decrease raining (d) do not observe
13. Which month do you usually know as the heavy raining? (a) falgun (b) chiotro (c) boishak (d) josto (e) asar (f) srabon (g) bhadro (h) do not know
14. Can you tell the most rainy years and months during last ten years?
15. Do you know what cause the climate changes? (a) Yes (b) No
    a) If yes, can you name some factors that cause climate changes?
16. According to your experience, how climate change impacted in your life during last ten years?
17. How many climate change events did you face during last ten years?
18. Please mention the climate change events.
19. Which one was the most severest to tackle and when?
20. Do you know why the climate changes events such as cyclones, flooding, drought etc. occur?
21. Why do the climate change events occur?
22. According to your experience, how do you tackle the extreme event?
23. Climate change is happenging in Bangladesh.
    (a) Strongly agree (b) Agree (c) Unsure (d) Disagree (e) Strongly disagree
24. Climate change is an important issue in Bangladesh.
    (a) Strongly agree (b) Agree (c) Unsure (d) Disagree (e) Strongly disagree
25. Climate change is the result of human activities.
    (a) Strongly agree (b) Agree (c) Unsure (d) Disagree (e) Strongly disagree
26. Climate change isn't natural.
    (a) Strongly agree (b) Agree (c) Unsure (d) Disagree (e) Strongly disagree
27. Environmental education can minimize the adverse impacts of climate change.
    (a) Strongly agree (b) Agree (c) Unsure (d) Disagree (e) Strongly disagree
28. Changing human behavior can contribute to tackle adverse impacts of climate change.
    (a) Strongly agree (b) Agree (c) Unsure (d) Disagree (e) Strongly disagree
29. Community level participation is needed to tackle with the climate change.
    (a) Strongly agree (b) Agree (c) Unsure (d) Disagree (e) Strongly disagree

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